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Advisory Circular

/INCLUDES CHANGE 1/

Subject: SPECIFICATION FOR TAXIWAY AND
RUNWAY SIGNS

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Change:

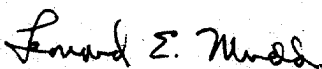
1. PURPOSE. This advisory circular (AC) contains the specification for lighted and unlighted signs to be used on **taxiways** and runways.

2. CANCELLATION. AC 150/5345-44E, Specification for **Taxiway** and Runway Signs, dated December 16, 1991, is cancelled.

3. APPLICATION. The standards contained herein are recommended by the Federal Aviation Administration (FAA) in all applications involving airport development of this nature. The standards are mandatory for projects funded under the airports grant program.

4. EXPLANATION OF CHANGE. The specification has been revised to include a specification for unlighted **taxiway** and runway signs.

5. METRIC UNITS. To promote an orderly transition to metric units, the specification includes both English and metric dimensions. The metric conversions may not be exact equivalents and, until there is an official changeover to the metric system, **the** English dimensions will govern.


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Director, Office of Airport Safety and Standards

SPECIFICATION FOR TAXIWAY AND RUNWAY SIGNS

1. SCOPE AND CLASSIFICATION.

1.1 Scope. This specification contains the requirements for lighted and unlighted signs used on airport **taxiways** and runways.

1.2 Classification. Four types of signs may be specified in any of five sizes, five styles, and two classes, except as noted below.

1.2.1 Types. Signs of the following types are included:

Type L-858Y	Direction, Destination, and Boundary signs • black legend on a yellow background
Type L-858R	Mandatory Instruction sign • white legend on a red background
Type L-858L	Taxiway and Runway Location signs • yellow legend and border on a black background
Type L-858B	Runway Distance Remaining sign • white legend on a black background

1.2.2 Sizes. Signs of the following -sizes are included:

size1 *	18-inch (460 mm) legend panel with a 12-inch (300 mm) legend
Size 2 *	24-inch (610 mm) legend panel with a 15-inch (380 mm) legend
Size 3 *	30-inch (760 mm) legend panel with an 18-inch (460 mm) legend
Size 4 **	48-inch (1220 mm) legend panel with a 40-inch (1020 mm) legend
size5 **	30-inch (760 mm) legend panel with a 25-inch (640 mm) legend

* Applicable only to Types **L-858R**, **L-858Y**, and L-858L.

** Applicable only to Type L-858B.

1.2.3 Styles. Signs of the following styles are included:

Style 1	Powered from a 120-volt AC power source.
Style 2	Powered from a series lighting circuit (4.8 to 6.6 amperes)
Style 3	Powered from a series lighting circuit (2.8 to 6.6 amperes or 8.5 to 20 amperes)
Style 4	Unlighted (Applicable only to Type L-858R , L-858Y , and L-858L)
Style 5	Powered from a series lighting circuit (5.5 amperes)

1.2.4 Classes. Lighted signs of the following classes are included:

Class 1	For operation down to -4°F (-20° C)
class 2	For operation down to -67°F (-55° C)

4.1.1 Sizes. The dimensions of the signs shall be in accordance with Table 1. Sign lengths shall be chosen to accommodate only complete message elements. When required, a sign array may contain multiple signs of the same size (mounting height and face height) installed end-to-end on a straight line. When multiple signs are used, the separation distance between legend panels shall be 3 to 12 inches (76 to 305 mm). Internally and externally lighted signs shall not be installed in the same sign array. See Appendix 3 for examples of sign arrays.

Table 1. Sign Dimensions

Size	Legend Height		Legend Panel Height		Overall Mounting Height		Maximum Overall Length	
	Inches	mm	Inches	mm	Inches	mm	Inches	mm
1	12	300	18	460	24-30	610-760	120	3050
2	15	380	24	610	30-36	760-910	145	3690
3	18	460	30	760	36-42	910-1070	170	4290
4	40	1020	48	1220	54-60	1370-1520		
5	25	640	30	760	36-42	910-1070		

NOTE: Legend heights for Runway Safety Area/Obstacle Free Zone (OFZ) and Runway Approach Area Boundary; ILS Critical Area Boundary; and No Entry signs are specified in Appendix 2, Tables I, II, and III, respectively.

4.1.2 Mounting Legs. Mounting legs for **each** sign shall have frangible points located 2 inches (51 mm) or less above the concrete pad or stake. The frangible points shall withstand wind loads due to jet blasts of 200 mph (322 km/h) but will break before reaching an applied static load over the legend panel of 1.3 psi (8.96 kPa). Legend panels and panel supports shall withstand, at a minimum, that pressure at which the frangible points break.

4.1.3 Sign Faces. The signs may be either single face (message only **on** one side) or double face (messages on two sides). The sign faces shall have retroreflective material and shall meet the color and reflectivity requirements of ASTM D 4956, Type I Sheeting. Retroreflective material, when installed, shall not be warped or wrinkled. The spacing, stroke, and shape of legend characters, numerals, and symbols shall be in accordance with Appendix 1 and 2 of this specification. Type L-858L sign faces shall have a margin and a border in accordance with paragraphs 4.1.3.1 and as shown in Appendix 3, Figures 2 and 3. Message dividers shall be in accordance with paragraph 4.1.3.2.

4.1.3.1 Margin and Border for Type L-858L Signs. The sign faces of Type L-858L shall have a continuous border $13/16$ inch (21 mm) wide for size 1; $1-1/16$ inches (27 mm) wide for size 2; and $1-1/4$ inches (32 mm) wide for size 3 signs. The border color shall be the same as that of the legend. The border shall be set in from the edge of the sign to yield a continuous margin $11/16$ inch (17 mm) for Size 1; $1-7/16$ inches for Size 2; and 2 inches for Size 3 signs. The horizontal distance from the edge of a character or numeral to the inside edge of the border shall be as specified in Appendix 1, Table VII, for the appropriate sign size.

4.1.3.2 Message Dividers. Vertical message dividers shall be used to separate the message elements (e.g., "C->", "<-T->", "15-APCH," etc.) of a sign array, as shown in Appendix 3, Figures 1, 2, and 4. Message dividers shall not be used to separate Type L-858L signs from Type L-858Y or Type L-858R signs when they are collocated. Message dividers shall be $1-5/16$ inches (33 mm) in width for size 1; $1-11/16$ inches (43 mm) for size 2, and 2 inches (51 mm) for size 3 signs. Message dividers shall extend from the top to the bottom of the legend panel. Message divider color shall be the same as that of the legend.

4.1.4 Sign Power. Style 1, 2, 3, and 5 signs shall be internally lighted. Style 1 signs shall be designed for operation from a 120-volt AC power source. Style 2 signs shall be designed for operation from an airport series lighting circuit with a current range of 4.8 to 6.6 amperes. Style 3 signs shall be designed for operation from an airport series lighting circuit with a current range of 2.8 to 6.6 amperes or a current range of 8.5 to 20 amperes. Signs installed on a 20 ampere circuit should use an appropriate isolation transformer with a 6.6 ampere secondary. Style 2 and Style 3 signs shall meet the luminance requirements in 4.1.4.1 throughout the current range of the associated series circuit. Style 5 signs shall be designed for operation from an airport series lighting circuit with a current of 5.5 amperes. Style 5 signs shall be installed on a circuit, containing only these signs, which is powered with a three step regulator preset to 5.5 amperes output. The regulator control system shall be designed to meet the

4.8.2 Qualification Tests. All tests contained in 4.8.3, 4.8.4, and 4.8.5 are applicable for certification.

4.8.3 General Tests.

4.8.3.1 Visual Examination. For this test, Type L-858Y signs shall have at least two message elements separated by a message divider, Type L-858R signs shall have a legend which reads "18- 36," and Type L-858L signs shall have a legend which reads "B." The signs shall be examined for compliance with the requirements for dimension & materials, component ratings, materials, finish, and quality of workmanship. Signs shall be viewed in daylight from a distance of 800 ft (244 m). The sign type, as defined in paragraph 1.2.1, should be readily identifiable. The sign face and retroreflective material shall appear to be smooth and shall be free of any aberration (except at the panel joints of modular signs). Legend and/or background colors on modular signs shall be continuous across panel joints. Signs shall be viewed from a distance of 800 ft (244 m) at nighttime to determine if the luminance level is sufficient to make the Type L-858Y and L-858R background colors, and Type L-858L legend and border color readily discernible, or in the case of distance remaining signs to determine if the legend is readily discernible. Style 2 and Style 3 signs shall be viewed while the input current is varied throughout the range on which the sign is to operate. Modular signs shall then be viewed from a distance of 200 feet (61 m) with the sign at full brightness. The panel joints shall not interfere with the legibility of the sign nor leak light which would cause a discontinuous color across the joint.

4.8.3.2 Wind Load and Frangibility Test. The signs shall be tested for their ability to withstand loads of 200 mph (322 km/h) without damage. The test shall be performed with sign completely assembled and mounted by the base assembly. If the loading is applied with the sign mounted on a vertical surface, the weight of the sign shall be included as part of the total applied weight. The test shall be designed to ensure the legend panel received the full load. Spring mounted signs designed to swing shall be locked to prevent movement during the test. A static load of 0.9 psi (621 kPa) shall be applied uniformly over the entire surface of the legend panel for a period of 10 minutes. The sign shall not break at the frangible points nor suffer permanent distortion. The static load shall then be increased until the sign breaks at the frangible points. The breaking shall occur before the loading reaches an applied static load over the legend panel of 1.3 psi (8.96 kPa). The legend panel and panel supports shall then be inspected for evidence of damage. Any breakage or deformation shall be cause for rejection. Note: Spring mounted signs may alternatively be tested according to the procedure in 4.8.3.3.

4.8.3.3 Spring Mounted Signs. With the legend panel protected, the sign shall be tested for frangibility according to 4.8.3.2. The sign shall then be unlocked and subjected to P_{break} (the pressure at which the frangible points break). The sign face swing angle, θ , caused by the pressure, P_{break} , shall be measured. The pressure, P_{swing} , shall then be computed as follows: $P_{swing} = P_{break} \times (\cosine \theta)$. With the sign relocked and the legend panel protection removed, the P_{swing} shall be applied uniformly over the entire surface of the legend panel for 1 minute. The legend panel and panel supports shall then be inspected for evidence of damage. Any breakage or deformation shall be cause for rejection.

4.8.4 Photometric Test.

4.8.4.1 Photometer Parameters. A foot-candle meter or telephotometer shall be used for this test. Before testing, photometric equipment shall be calibrated in accordance with IES LM-52. The foot-candle meter shall be calibrated to measure luminance and shall have a (1-inch (25 mm) long collimating luminance adapter tube (black on the inside) placed between the sign and the meter. The telephotometer, shall be well color-corrected and calibrated to measure luminance. Either system shall be designed to measure a "spot" on the sign face of 1.5 inches (38.1 mm) in diameter. Light emitted only from the sign shall be permitted to reach either meter. Style 2 and Style 3 signs shall be tested at each input current throughout the range on which the sign is to operate.

4.8.4.2 Sign Types and Sizes. Photometric testing shall be conducted on size 1, 2, and 3 for each of Type L-858Y, L-858R and L-858L signs. If the luminance design of a double face sign is symmetrical for both faces, then only one face should be tested. The length of Types L-858Y and L-858R to be tested shall be at least 45 inches (1140 mm). Signs employing modular construction shall contain at least two modules for this test.

4.8.4.3 Sign faces. Type L-858Y and L-858L signs shall have an entirely yellow sign face made from the same material used to create the background on production L-858Y signs or the legend and border on production L-858L signs, respectively. Type L-858R signs shall have an entirely white sign face made from the same material used to create the legend on production L-858R signs.

Table 2. Sign Dimensions

Size	Legend Height		Legend Panel Height		Overall Mounting Height		Maximum Overall Sign Length		Minimum Sign Length	
	Inches	mm	Inches	mm	Inches	mm	Inches	mm	inches	mm
1	12	300	18	460	24-30	610-760	120	1524	30	762
2	15	380	24	610	30-36	760-910	145	1829	36	914
3	18	460	30	760	36-42	910-1070	170	2134	42	1067

NOTE: Legend heights for Runway Safety Area/Obstacle Free Zone (**OFZ**) and Runway Approach Area Boundary; ILS Critical Area Boundary; and No Entry signs are specified in Appendix 2, Tables I, II, and III, respectively.

5.1.3 Mounting Legs. Mounting legs for each sign shall have frangible points located 2 inches (51 mm) or less above the concrete pad or stake. The legs shall be mounted, to the back of the sign, or in a manner which does not obstruct any portion of the sign front. The frangible points for mode 1 signs shall withstand wind loads due to jet blasts of 100 mph (161 km/h), but will break before reaching an applied static load over the legend panel of 0.9 psi (6.21 kPa). The mode 1 signs must withstand 100 mph winds and jet blast/prop wash from aircraft without bending or changing shape. The frangible points for mode 2 signs shall withstand wind loads due to jet blasts of 200 mph (322 km/h) but will break before reaching an applied static load over the legend panel of 1.3 psi (8.96 kPa). The mode 2 signs must withstand 200 mph winds and jet blast/prop wash from aircraft without bending or changing shape.

5.1.4 Sign Faces. The sign background, except for black, shall consist of retroreflective sheeting. The sheeting shall be applied to signs prepared in accordance with the recommendations of the retroreflective sheeting manufacturer. The sign panel with the sheeting shall be finished, free of cracks, wrinkles, blisters, and warps, and shall present a smooth surface of uniform color. All units of the sign message shall be formed to provide a continuous stroke width with smooth edges and shall present a flat surface free from warps, blisters, wrinkles, and burrs. The background and legend color shall be as specified for each type of sign. The sign face shall be constructed by the direct applied characters process or the screen process in accordance with 5.1.4.1 and 5.1.4.2, respectively. The spacing, stroke, and shape of legend characters, numerals, and symbols shall be in accordance with Appendix 1 and 2 of this specification. Type L-858L sign faces shall have a margin and a border in accordance with paragraphs 5.1.4.3 and as shown in Appendix 4, Figures 1 and 2. Message dividers shall be in accordance with paragraph 5.1.4.4. Corners of sign faces shall be rounded to a radius of **1-1/2 inches ±1/8"**.

5.1.4.1 Direct Applied Character Process. Letters, numerals, symbols and border of the sign shall be cut from retroreflective sheeting and shall be applied in accordance with the manufacturers recommendations.

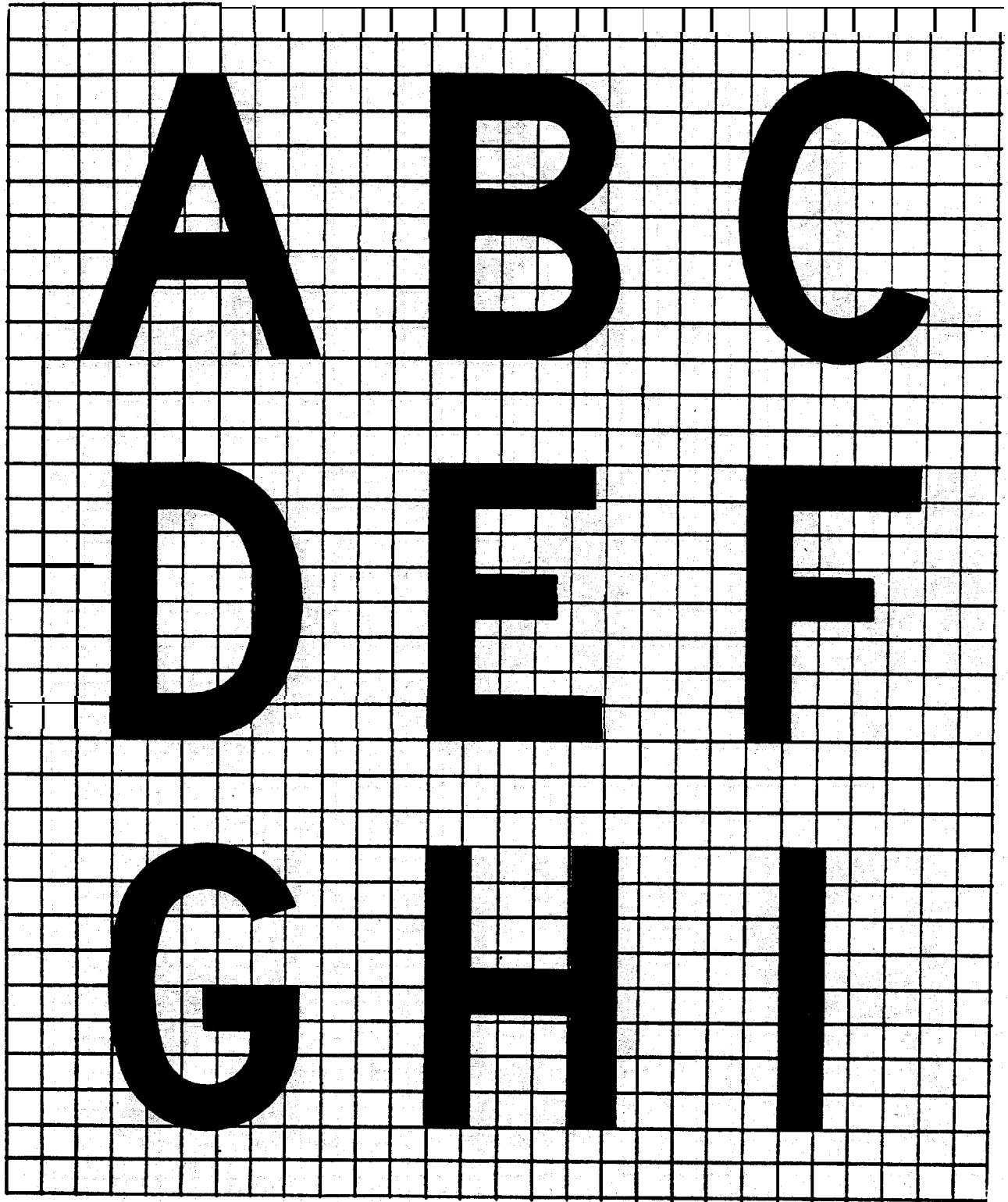
5.1.4.2 Screen Process. Letters, numerals, symbols, and border of sign shall be applied to the retroreflective sheeting or opaque background of sign by direct or reverse screening. The sign message for Type **L-858Y** shall be applied to retroreflective sheeting by direct screening process. Sign message for Type **L-858L** and Type **L-858R** shall be produced by the reverse screening process.

5.1.4.3 Margin and Border for Type L-858L Signs. The sign faces of Type L-858L signs shall have a continuous border **12/16 inch (21 mm)** wide for Size 1; **1-1/16 inches (27 mm)** wide for Size 2; and **1-1/4 inches (32 mm)** wide for Size 3 signs. The border shall be the same color as the legend. The border shall be set in from the edge of the sign to yield a continuous margin **11/16 inch (17 mm)** for Size 1; **1-7/16 inches** for Size 2; and **2 inches** for Size 3 signs. The horizontal distance from the edge of a character or numeral to the inside edge of the border shall be as specified in Appendix 1, Table VIII, for the appropriate sign size. This distance may be increased, if necessary, to meet the minimum sign length specified in Table 2. The border shall be square at each corner of the sign (see Corner Detail, Appendix 4, Figure 2).

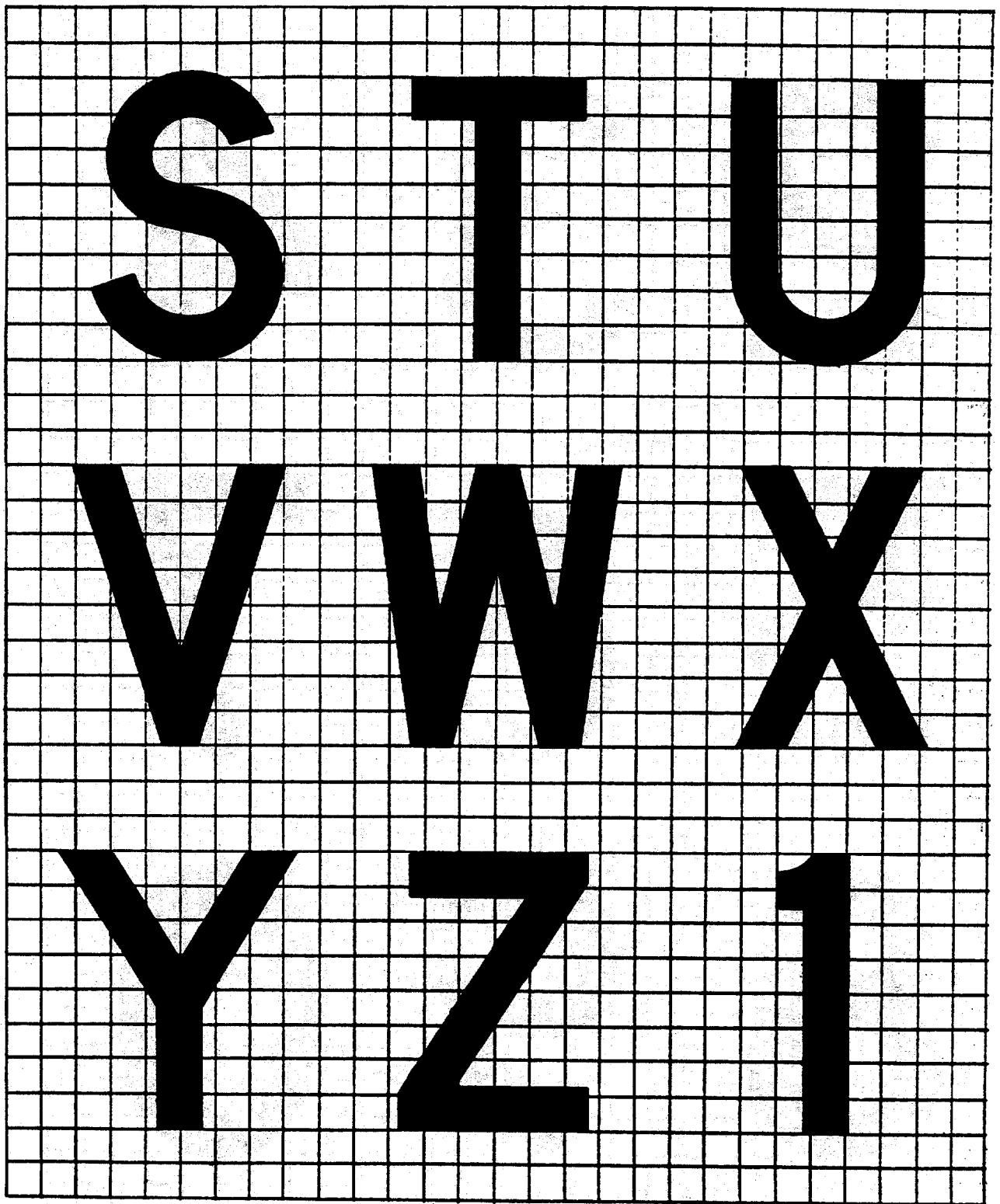
5.1.4.4 Message Dividers. Vertical message dividers shall be used to separate the message elements (e.g., "C->", "<-T->", "15-APCH", etc.) of a sign array, as shown in Appendix 3, Figures 1, 2, and 4. Message dividers shall not be used to separate Type L-858L signs from Type L-858Y or Type L-858R signs when they are collocated. Message dividers shall be **1-5/16 inches (33 mm)** in width for size 1; **1-11/16 inches (43 mm)** for size 2; and **2 inches (51 mm)** for size 3 signs. Message dividers shall extend from the top to the bottom of the legend panel. Message divider color shall be the same as that of the legend.

APPENDIX I-INSRIPTIONS FOR SIGN FACES

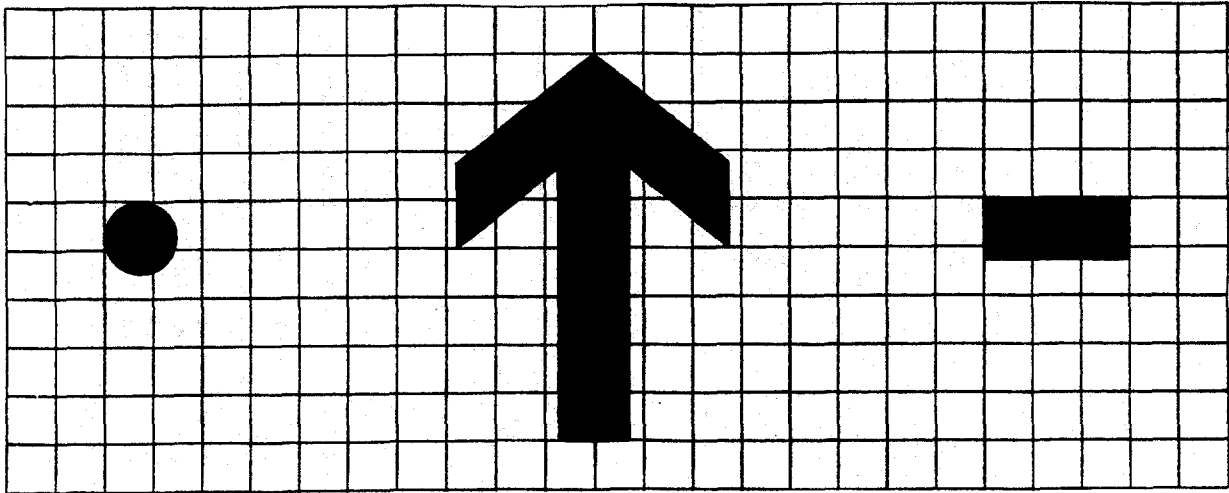
This Appendix shows the shapes of the letters, numbers, and symbols used in inscriptions for sign faces.



Sign Legend Characters



Sign Legend Characters and Numeral 1 for Size 1, 2, and 3 Signs



- (a) The arrow stroke width, diameter of the dot, and both width and length of the dash, shall be proportioned to the character stroke widths as defined in Table III.
- (b) The dimensions of the arrow shall remain constant for a particular sign size, regardless of orientation.

TABLE I			
LETTER TO LETTER CODE NUMBER			
Preceding Letter	Following Letter		
	B, D, E, F, H, I, K, L, M, N, P, R, U,	C, G, O, Q, S, X, Z,	A, J, T, V, W, Y,
B	2	2	4
C	11	11	2
D	1	2	3
E	2	2	2
F	2	2	3
G	1	2	2
H	1	1	2
I		1	2
J	2	1	2
K	2	2	3
L			4
M	1	2	2
N	1	1	2
O	1	1	2
P	1	2	2
Q	1	2	2
R			
S	1	2	11
T	2	2	4
U	1	1	2
V	2	2	4
W	2	2	4
X	2	2	3
Y	2	2	4
Z	2	2	3

NOTE: The minimum spacing between a letter or numeral and a dash or dot shall be 4 inches.

To determine the property space between letters or numerals, obtain the code number from Table I or II and enter Table VI for that code number to the desired letter or numeral height.

TABLE II			
NUMERAL TO NUMERAL CODE NUMBER			
Preceding Numeral	Following Numeral		
	1, 5,	2, 3, 6, 8, 9, 0,	4, 7,
1	1	1	2
2	1	2	2
3		2	2
4	a	2	4
5	1	2	2
6	1	2	2
7	2	2	4
8	1	2	2
9	1	2	2
0	1	2	2

Table VII, Spacing for Borders and Message Dividers
(Lighted Signs)

Letter or Numeral Height

12 in 300 mm	15 in 380 mm	18 in 460 mm	25 in 640 mm	40 in 1020 mm
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Minimum Spacing between Legend and Border (or Sign Edge, if no Border)

1.50 in 38.1 mm	2.00 in 50.8 mm	2.50 in 63.5 mm	3.00 in 76.2 mm	4.00 in 101.6 mm
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Horizontal Spacing Between Legend and Border for Type **L-858L**,
Taxiway Location Signs, which contain a single character

Not Applicable for 25 in. or 40 in. Letters

3.00 in 76.2 mm	3.50 in 88.9 mm	4.00 in 101.6 mm	
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Horizontal Spacing Between Legend and Border (or Sign Edge, if
no Border) for Types L-858R or **L-858L**, Runway Location Signs,
which contain a single digit

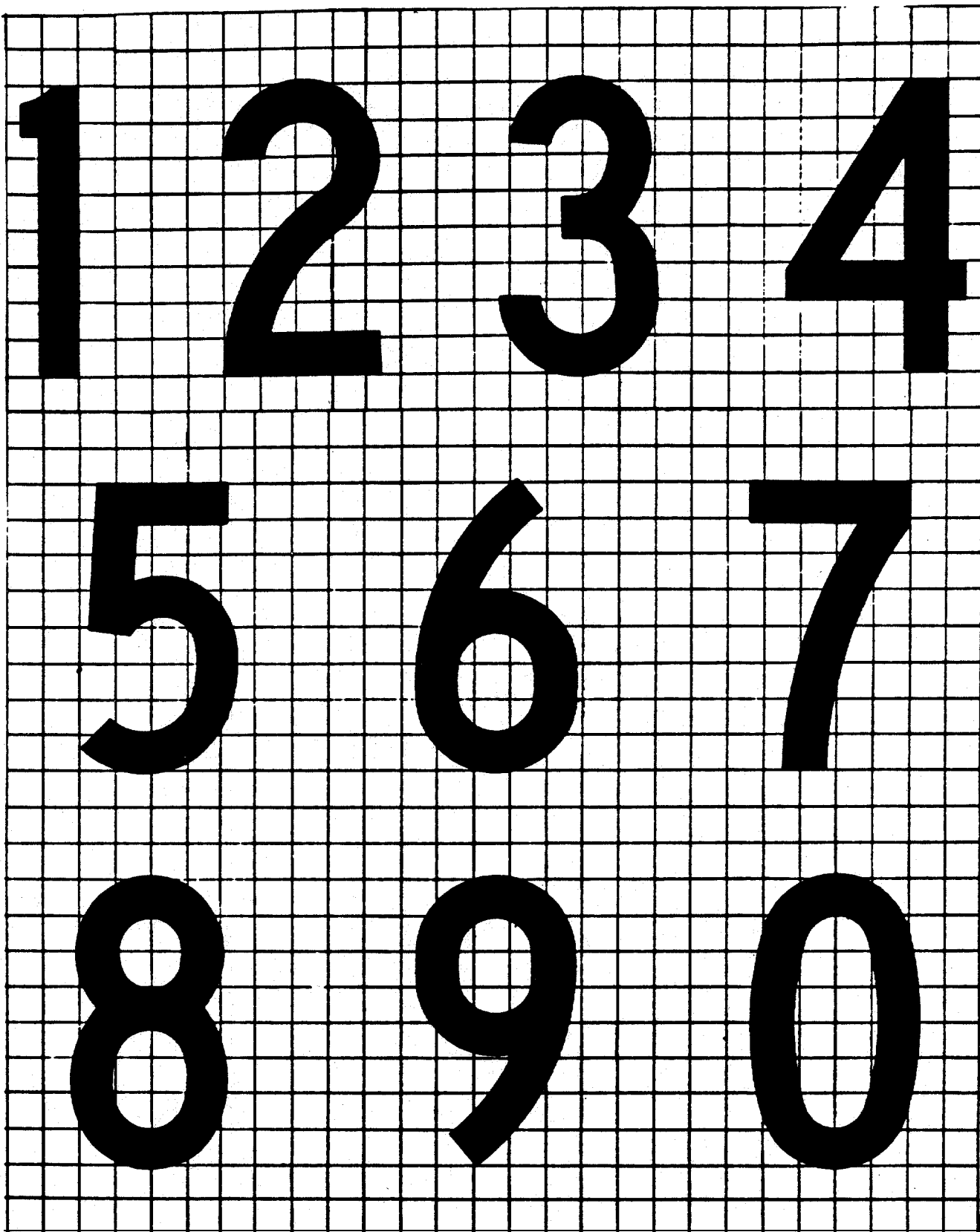
Not Applicable for 25 in. or 40 in. Letters

6.00 in 152.4 mm	6.50 in 165.1 mm	7.00 in 177.8 mm	
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Minimum Spacing between Legend and Message Divider

Not Applicable for 25 in. or 40 in. Letters

3.00 in 76.2 mm	3.50 in 88.9 mm	4.00 in 101.6 mm	
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Numerals for Size 4 and 5 Signs

APPENDIX 2—SIGN LEGENDS

This Appendix shows the dimensions for runway safety **area/OFZ**, runway approach boundary, ILS critical area, and no entry sign.

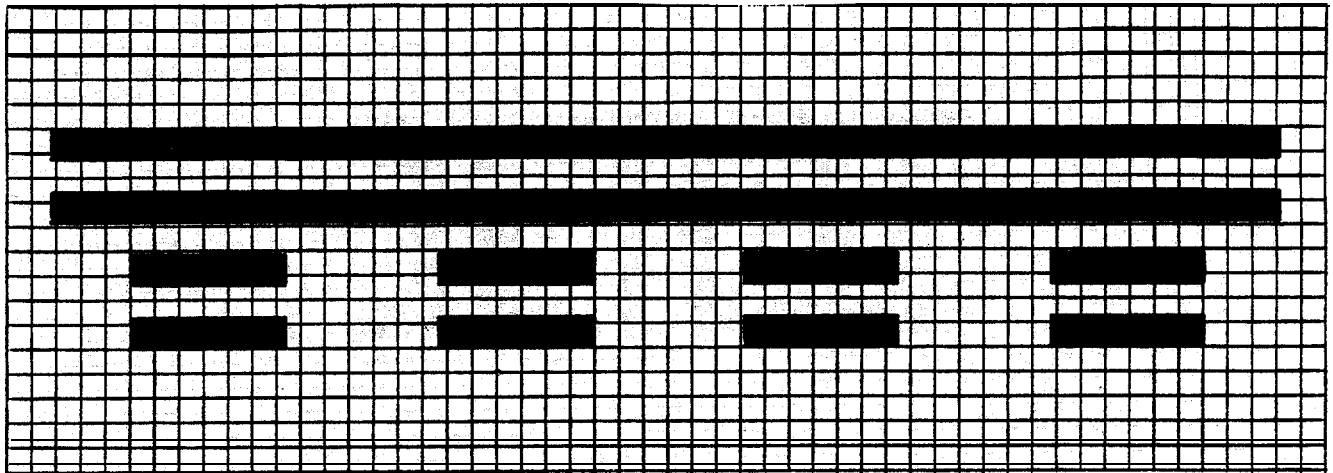


Figure 1. Runway Safety Area/OFZ and Runway Approach Boundary Sign.

TABLE I. DIMENSIONS FOR RUNWAY SAFETY AREA/OFZ AND RUNWAY APPROACH BOUNDARY SIGNS

	Size 1		Size 2		Size 3	
	(in)	(mm)	(in)	(mm)	(in)	(mm)
Legend Height	9.0	228.8	12.0	304.8	15.0	381.0
Length Length	57.5	1460.5	73.0	1854.2	84.0	2133.6
Stroke Width	1.29	32.8	1.72	43.7	2.14	54.4
Dash Length	7.18	182.4	9.12	231.6	10.5	266.7

- (a) Legend length may vary ± 2 inches (50.8).
- (b) Vertical spacing between bars shall be equal to the stroke width.
- (c) Horizontal spacing between dashes shall be equal to the dash length.
- (d) Dash length and horizontal spacing shall vary proportionally to legend length.
- (e) The yellow background of the boundary sign should not extend beyond the ends of the solid horizontal bars.

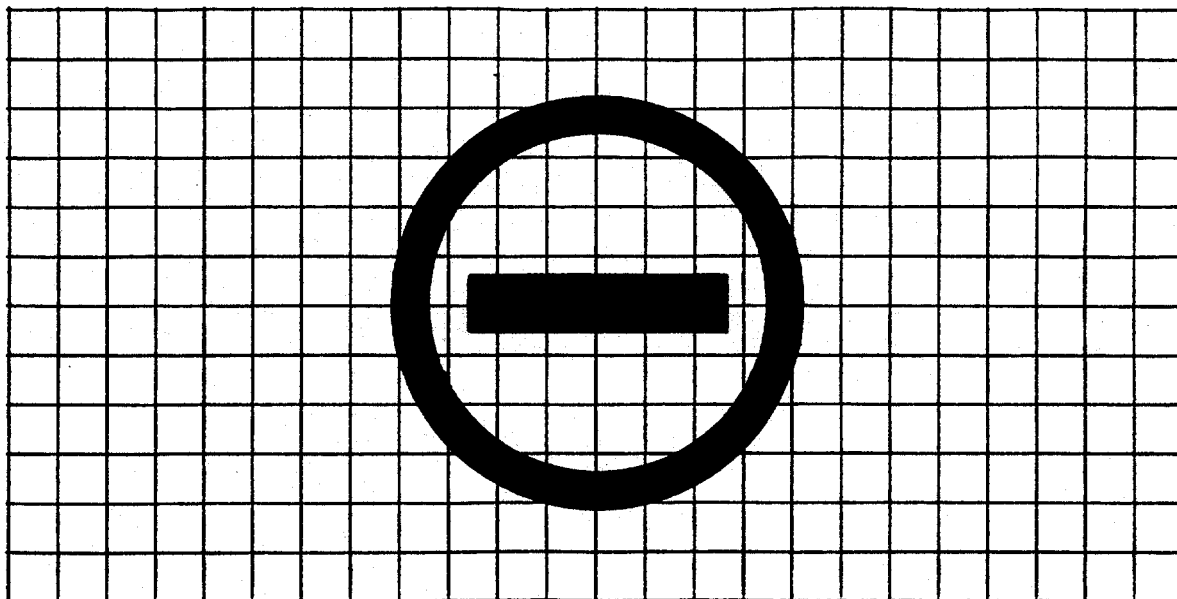


Figure 3. No Entry Sign

TABLE III. DIMENSIONS FOR NO ENTRY SIGNS

	Size 1		Size 2		Size 3	
	(in)	(mm)	(in)	(mm)	(in)	(mm)
Minimum Legend Panel Length	24.0	609.6	32.0	812.8	40.0	1016.0
outer Radius	7.35	186.7	9.75	247.7	12.2	309.9
Inner Radius	6.05	153.7	7.95	201.9	10.0	254.0
Dash Length	9.3	236.2	12.4	315.0	15.5	393.7
Dash Width	2.0	50.8	2.7	68.6	3.3	83.8

APPENDIX 3—SIGN ARRAYS

(LIGHTED SIGNS)

This Appendix represents typical installations of signs containing multiple message elements and sign types.

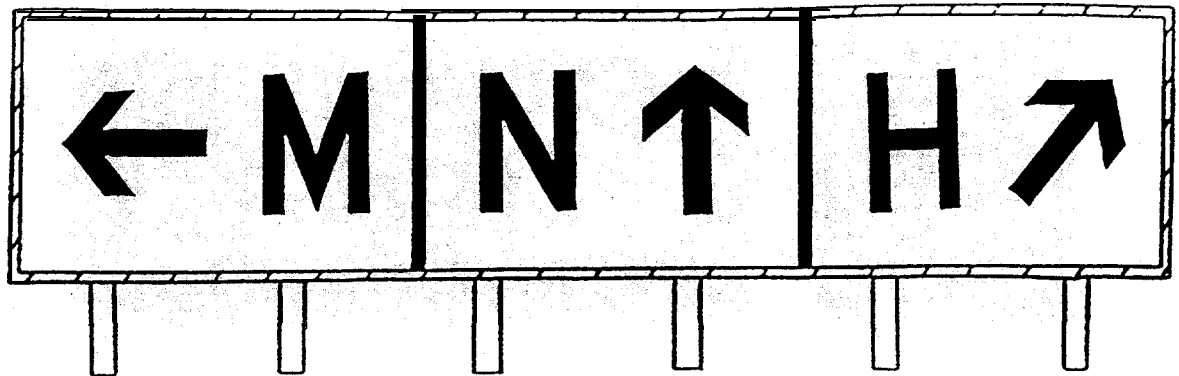


Figure 1. Type L-858Y Direction Sign array which contains three message elements **separated** by message dividers. On modular signs, the message dividers may be coincident with panel joints. Figure not drawn to scale.

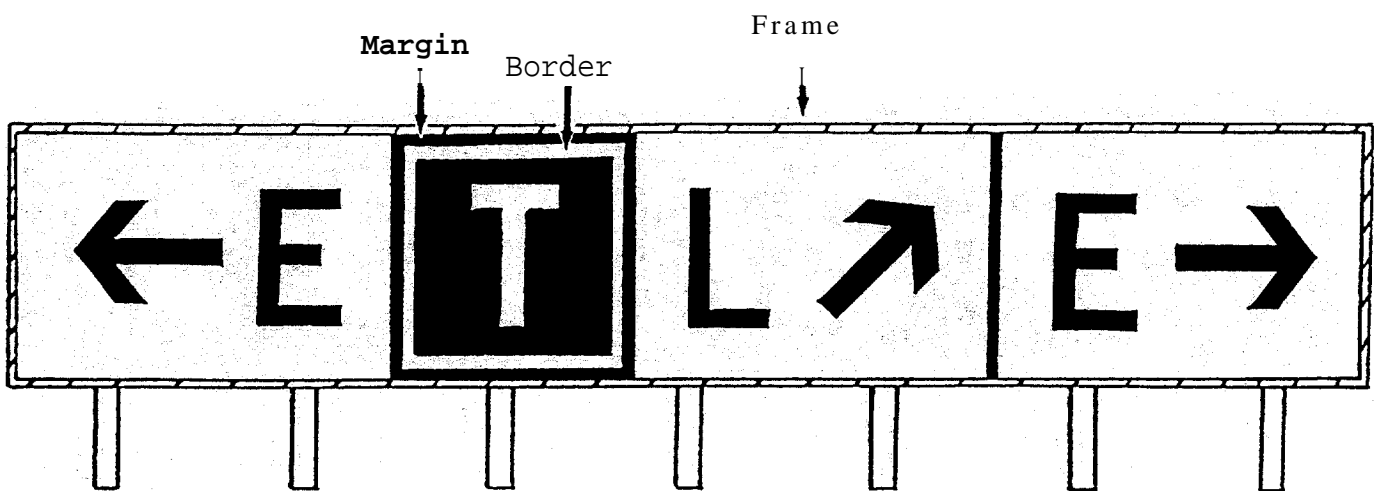


Figure 2. Sign array which contains two type L-858Y Direction Signs separated by a Type L-858L Taxiway Location Sign. The Type L-858Y sign on the right **contains** two message elements separated by a message divider. Figure not drawn to scale.

APPENDIX 4—SIGN ARRAYS

(UNLIGHTED SIGNS)

This Appendix represents typical installations of signs containing multiple message elements and sign types.

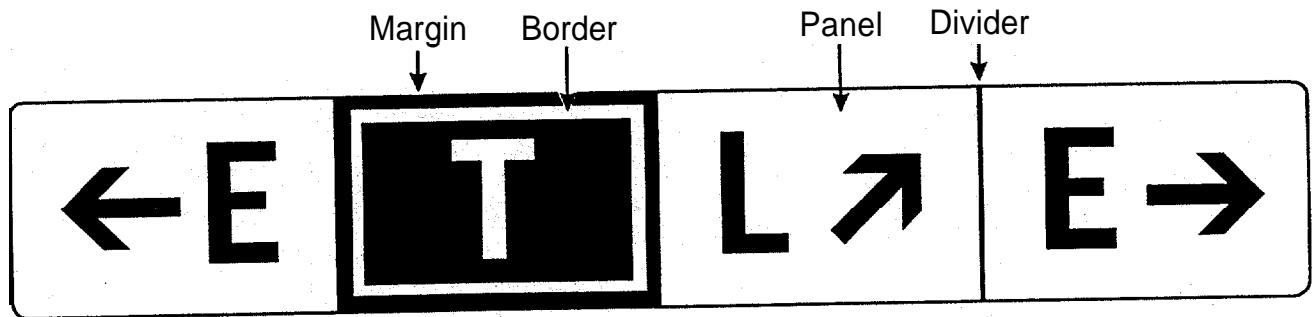


Figure 1. Sign array which contains two type L-858Y Direction Signs separated by a Type L-858L Taxiway Location Sign. The Type L-858Y sign on the right contains two message elements separated by a message divider. Figure not drawn to scale.

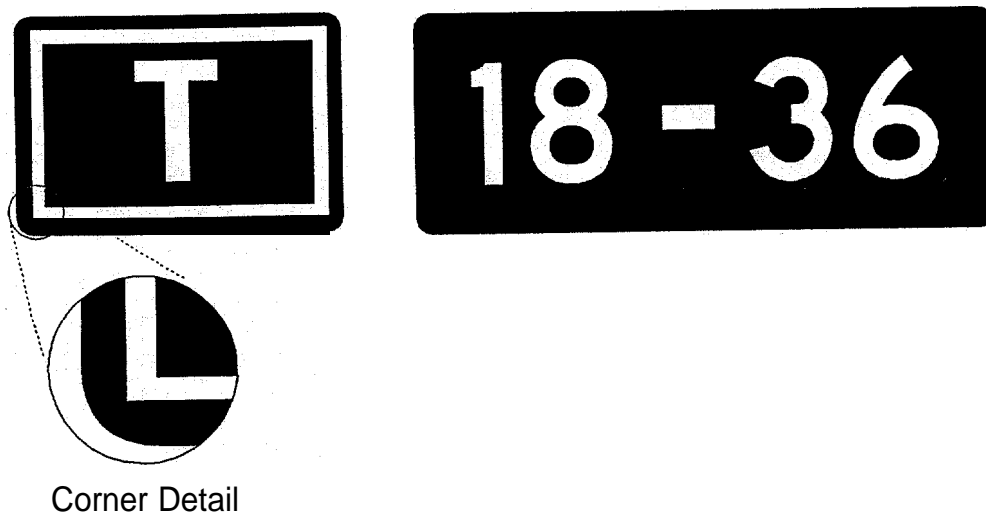


Figure 2. Sign array (made up of multiple signs) which contains a Type L-858L Taxiway Location Sign and an L-858R Runway Holding Position Sign. Figure not drawn to scale.